UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:
SR- 6J

June 27, 2012

Mr. Michael J. Erickson
Associate Vice President/Principal Engineer
ARCADIS
10559 Citation Drive, Suite 100
Brighton, Michigan 48116

RE: Area 1: Supplemental Remedial Investigation Report Approval

Dear Mr. Erickson:

The United States Environmental Protection Agency (EPA) has completed its review of the revised Area 1 Supplemental Remedial Investigation (SRI) Report, submitted on February 21, 2012, for the Allied Paper,Inc./Portage Creek/Kalamazoo River Superfund Site. This revised SRI report focuses on the nature and extent of contamination within Area 1 of the Kalamazoo River from Morrow dam to the former Plainwell dam, and includes portions of Portage Creek from Alcott Street to the confluence of the Kalamazoo River.

The revised SRI report adequately addressed the majority of EPA's previous comments. However in completing the final review of the SRI report an error was noted in the Terrestrial Baseline Risk Assessment (TBERA) soil-to-egg bioaccumulation factor (BAF) for estimating exposure point concentrations. EPA has enclosed five comments, one addressing the BAF issue, and the others clarifying language provided in both the TBERA and the Executive Summary.

Therefore, EPA approves the revised Area 1 SRI report pending receipt of Georgia Pacific, LLC's (Georgia Pacific) responses to the enclosed comments and a final SRI report incorporating the modifications. Georgia Pacific must submit its responses to the enclosed comments and a final SRI report within (60) sixty days of receipt of this letter.

Please contact me at (312) 886-0992 if you have any questions regarding this matter.

Sincerely,

James A. Saric
Remedial Project Manager
SFD Remedial Response Branch #1

Enclosure

cc: Paul Bucholtz, MDNRE
Garry Griffith, Georgia-Pacific
Richard Gay, Weyerhaeuser

U.S.EPA COMMENTS
ON THE FEBRUARY 2012 REVISED
AREA 1 SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SITE

SPECIFIC COMMENTS

Commenting Organization: EPA **Commenter: Dillon**
Section: Executive Summary **Page #: ES-6** **Lines #: NA**
Specific Comment #: 1

The second bullet on page ES-6 of the SRI executive summary should be changed to read:

For birds, current research indicates that it is appropriate to separate them into different and identifiable categories of sensitivity, so in the TBERA, risks were assessed for high, moderate, and low sensitivity insectivores and vermivores. The multiple lines of evidence considered support conclusions of no unacceptable risk to any moderate or low sensitivity species, and as no high sensitivity vermivores have been identified at the Site in over 30 years of surveys conducted by the Kalamazoo River Nature Center, this category is not applicable. However, the categorization of avian receptors at the site is incomplete. Estimates are that between four and 17 high sensitivity species of which some may be vermivorous could be present on site. For high sensitivity insectivores (e.g., the grey catbird and European starling, represented by the house wren), the results were not in agreement – with one approach indicating no unacceptable risk and a second indicating likely risk.

Commenting Organization: EPA **Commenter: Dillon**
Section: 9.2.5 **Page #: 9-20** **Lines #: 30**
Specific Comment #: 2

Please add the following sentence after the one ending with "highly sensitive vermivores are present in Area 1."

However, the categorization of avian receptors at the site is incomplete. Estimates are that between four and 17 high sensitivity species of which some may be vermivorous could be present on site.

Commenting Organization: EPA **Commenter: Dillon**
Section: 9.2.6 **Page #: 9-22** **Lines #: 12**
Specific Comment #: 3

Please add the following sentence after the one ending with "over 30 years of surveys conducted by the Kalamazoo River Nature Center."

However, the categorization of avian receptors at the site is incomplete. Estimates are that between four and 17 high sensitivity species of which some may be vermivorous could be present on site.

Commenting Organization: EPA **Commenter: Dillon**
Section: Appendix B: TBERA **Page #: NA** **Lines #: NA**
Specific Comment #: 4

EPA recognizes the importance of separating the avian species by their relative sensitivity to the dioxin-like effects of PCBs. However, since not all species observed at the site have been sequenced and assigned to a sensitivity category, EPA believes that inclusion of an estimated number of species that may fall into the sensitive category would be useful in interpreting the risks posed by the site.

Please insert the following after the sentence below from paragraph 1 in Section 6.3.7 of the TBERA:

For vermivores, no high sensitivity species have been observed at the Site in over 30 years of surveys conducted by the KRNC. Of the 44 terrestrial (or largely terrestrial) species that have been observed along the Kalamazoo River and for which the AHR genetic sequence has been identified, the gray catbird and the European starling have been identified as being highly sensitive (type 1). *However, a limited number of species has been sequenced to date. Table 2X presents an estimate of the number of Type 1 species that may be present. The analysis indicates that between four and 17 species known to be found at the site are likely Type 1 or highly sensitive.*

Table 2X Confidence Bounds for Percentage and Number of Type-1 (sensitive) Avian Species at Allied Paper Inc/Portage Creek/Kalamazoo River Superfund Site

			Expected Number		Confidence Limits for Percentage Sensitive Species at Kalamazoo River			Confidence Limits for Number Sensitive Species at Kalamazoo River	
Sequenced	Type 1	Observed Percentage	N	Statistical Method	LCL 95	UCL95		LCL 95	UCL95
61	3	5%	8	Hyper-geometric	3%	11%		4	17

Notes:
1) The hypergeometric method (Buonaccorsi 1987) recognizes that a finite number of species have been identified at the site.

Commenting Organization: EPA **Commenter: Dillon**
Section: Appendix B: TBERA **Page #: NA** **Lines #: NA**
Specific Comment #: 5

After detailed review of the TBERA and SRI EPA believes that the soil-to-egg bioaccumulation factor (BAF) used in the TBERA for estimating exposure point concentrations is not appropriate. The following presents EPA's rationale. The TBERA reported a BAF of 0.55 and Blankenship (2005) reported a BAF of 0.76. Both analyses exhibit weaknesses that reduce the applicability of the BAF for estimating of RBCs and subsequently preliminary remedial goals.

TBERA Approach
A BAF of 0.55 (egg Total PCBs (ww)/Soil Total PCBs (dw) was reported in the TBERA. The analysis was based on dividing the average egg concentrations (8.2 mg/kg) by the impoundment wide average total PCB concentration (15 mg/kg), resulting in a BAF of 0.55 (8.2/15).

Surface PCB concentrations vary substantially within Trowbridge Impoundment, ranging from less than detection limits to over 40 mg/kg. There are also apparent spatial patterns suggesting that House Wrens with 1-2 acre home ranges would be exposed to something less than the full range of concentrations represented by the impoundment-wide mean. Nesting House Wrens would more likely be exposed to the range of the concentrations proximate to the nest box locations.

Blankenship Approach
Studies conducted by Michigan State University (Blankenship et al. 2005) also include estimates of the BAF for House Wren and Eastern Bluebird eggs at Trowbridge Impoundment. A component of the Michigan State studies was also to collect soil samples which were paired/co-located with biota samples for some species. Blankenship used a grid based sampling approach wherein several samples were composited to form a more precise estimate of the local mean exposure. The average of these soil grid samples was 6.5 mg/kg (as opposed to the 15 mg/kg used in the TBERA), which resulted in an estimated BAF of 0.76. Blankenship used a ratio of geometric means; however, the ratio of arithmetic averages when samples are not paired is preferred (Burkhard, 2009).

Conclusions
To evaluate the need to pair the egg data with soil data, the nest box locations were plotted on a map with the RI data used in the TBERA and locations of the nest boxes were compared with the closest soil concentrations. In addition, the locations of Blankenship's soil grids were also inspected qualitatively to evaluate how representative they might be relative to the impoundment wide average used in the TBERA. The map of nest box locations and all RI surface soil concentrations are shown in Figure 1 and the locations of Blankenship's soils grids are shown in Figure 2. It can be seen that the nest boxes at the north end of the study area are in close proximity to Blankenship's soil grid location 1. The southern-most nest box is in the vicinity of RI samples with PCB concentrations that range from 0.05 to 0.43 mg/kg. The nest box on the west side of the impoundment is located very close to the floodplain boundary, indicating that exposures to those birds would also be less than the impoundment average due

to a site use factor that would likely be less than 1. In total, four of the six house wren nest boxes are proximate to soil concentrations that are much lower than the impoundment wide average, suggesting that the data used by Blankenship may be more representative of exposures than the impoundment wide average. Based on this EPA believes that the Blankenship data can be used to derive a more spatially appropriate BAF. In addition to the BAF, Blankenship also reported the arithmetic mean and standard deviations for the egg and soil data so that BAFs based on arithmetic averages could be recalculated. A 95% UCL for the BAF was also calculated using formulas for the variance of a ratio of random variables (Frishman 1971).

Blankenship reported soil and house wren egg concentrations shown in Table 1 which resulted in an estimated BAF of 1.3 (8.23/6.53; UCL 95= 2.6) which is approximately a factor of 2 higher than that reported in the TBERA. Application of this BAF to estimate an RBC would result in a factor-of-two reduction in the Risk Based Concentration (RBC). For example, for the mid-sensitivity RBC based on the no-observed-adverse effects concentration the RBC would drop from 32 mg/kg to 24.6 based on the mean and 12.3 based on the 95% UCL. EPA believes this approach and specifically the 95% UCL of 2.6 is the more appropriate BAF to use to calculate the RBCs for exposure Approach 2.

Table 1. Arithmetic Average Estimate of BAF based on Blankenship (2005) Data

Soil		House Wren Eggs			
Mean	**Std.**	**Mean**	**Std.**	**BAF**	**95%UCL**
6.53	4.7	**8.23**	8.31	**1.3**	**2.6**
N=21		N=21			

While EPA believes this re-analysis to be important, EPA does not believe it is necessary to re-do the TBERA analysis completely. EPA's concerns can be addressed by adding the following text to the uncertainty section.

Please add the following after the first paragraph of Section 6.2.4.8 of the TBERA:

Studies conducted by Michigan State University (Blankenship et al. 2005) also include estimates of the BAF for House Wren eggs at Trowbridge Impoundment. A component of the Michigan State studies was also to collect soil samples which were paired/co-located with biota samples for some species. Blankenship et al. (2005) used a grid based sampling approach wherein several samples were composited to form a more precise estimate of the local mean exposure. The average of these soil grid samples was 6.5 mg/kg (as opposed to the 15 mg/kg used in the TBERA), which resulted in an estimated BAF of 0.76. Blankenship used a ratio of geometric means, however the ratio of arithmetic averages when samples are not paired is preferred (Burkhard, 2009).

Surface PCB concentrations vary substantially within Trowbridge Impoundment ranging from less than detection limits to over 40 mg/kg. There are also apparent spatial patterns suggesting that House Wrens with 1-2 acre home ranges would be exposed to a something less than the full range of concentrations represented by the impoundment-wide mean. Nesting House Wrens would more likely be exposed to the range of the concentrations proximate to the nest box locations. In addition to the BAF, Blankenship also reported the arithmetic mean and standard deviations for the egg and soil data so that BAFs based on arithmetic averages could be recalculated. A 95% UCL for the BAF was also calculated using formulas for the variance of a ratio of random variables (Frishman 1971).

Blankenship reported soil and house wren egg concentrations shown in Table 1X which resulted in an estimated BAF of 1.3 (8.23/6.53; UCL 95= 2.6) which is approximately a factor of 2 higher than that derived by using the impoundment wide averages. Application of the BAF based on the 95% UCL to estimate an RBC would result in a reduction in for example the NOAEL based RBC from 32 mg/kg to 12.3 mg/kg total PCBs and a subsequent change in the HQs.

Table 1X. Arithmetic Average Estimate of BAF based on Blankenship (2005) Data					
Soil		House Wren Eggs			
Mean	Std.	Mean	Std.	BAF	95%UCL
6.53	4.7	**8.23**	8.31	**1.3**	**2.6**
N=21		N=21			

References

Buonaccorsi, John P., 1987. Reviewed A Note on Confidence Intervals for Proportions in Finite Populations. The American Statistician, Vol. 41, No. 3 (Aug., 1987), pp. 215-218.

Burkhard, L. 2009. Estimation of Biota Sediment Accumulation Factor (BSAF) from Paired Observations of Chemical Concentrations in Biota and Sediment. U.S. Environmental Protection Agency, Ecological Risk Assessment Support Center, Cincinnati, OH. EPA/600/R-06/047.

Frishman, F. On the Arithmetic Means and Variances of Products and Ratios of Random Variables. Army Research Office, Durham, North Carolina. NTIS AD-785-623. 5285 Port Royal Rd, Springfield Va. 22151.

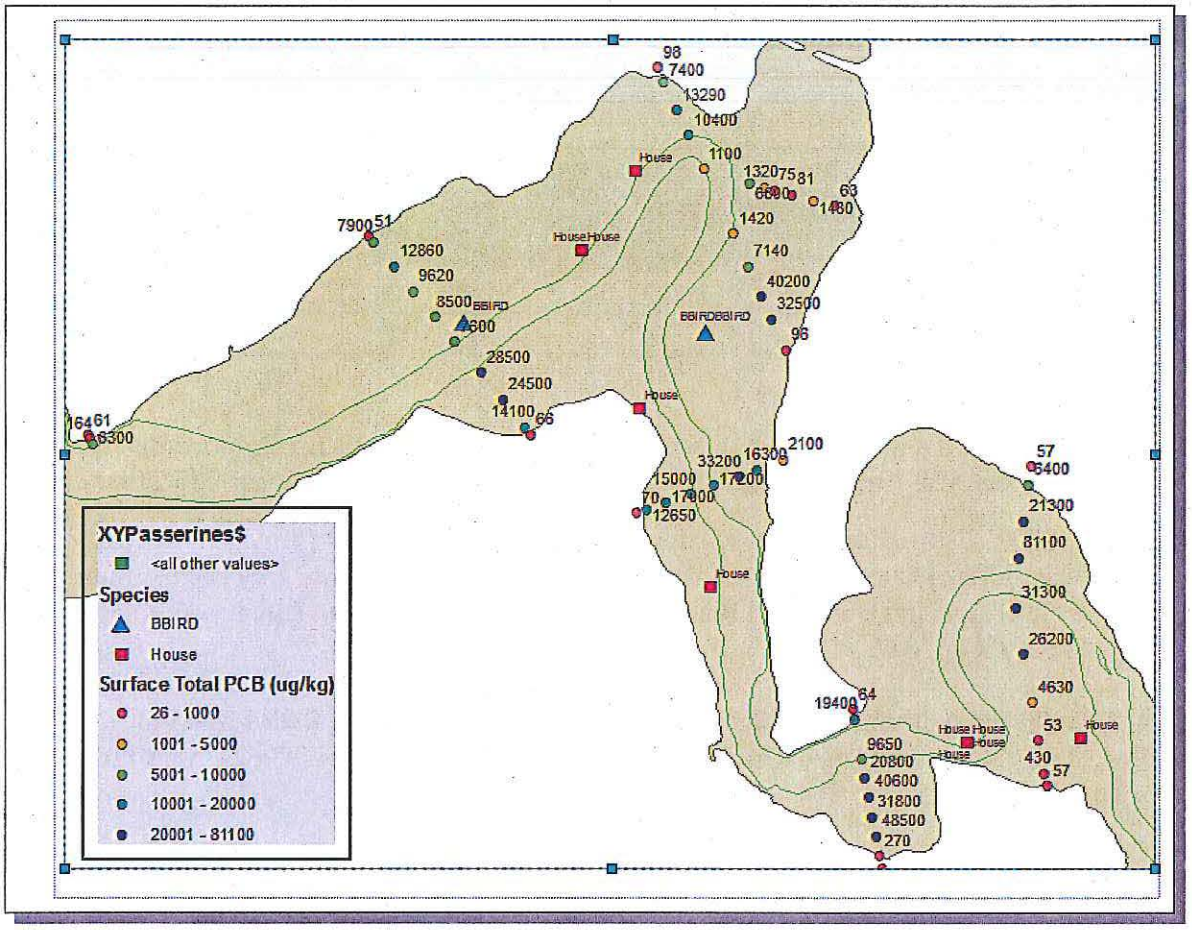

Figure 1. Surface soil total PCB concentrations and nest box locations.

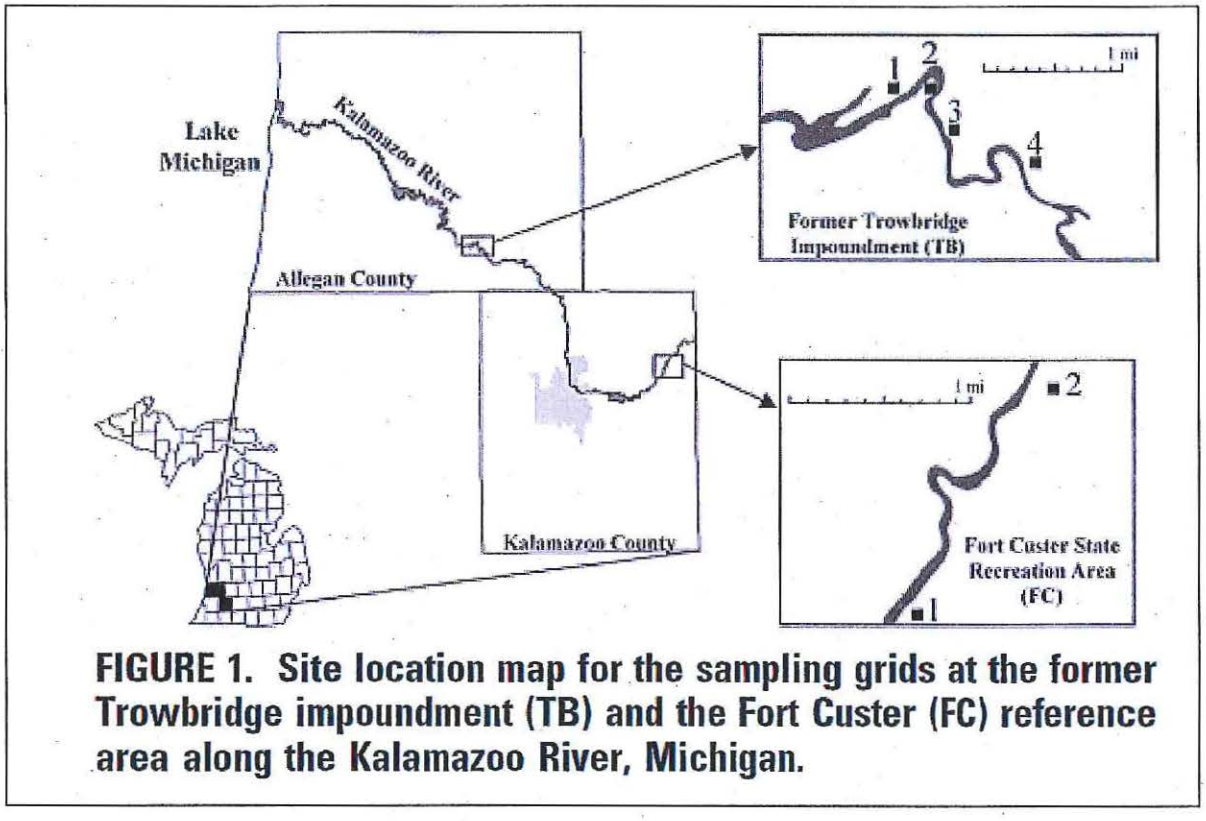

FIGURE 1. Site location map for the sampling grids at the former Trowbridge impoundment (TB) and the Fort Custer (FC) reference area along the Kalamazoo River, Michigan.

Figure 2. Location of terrestrial soil sampling grids (Excerpted from Blankenship, 2005).